PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
US Department of Commerce
United States Patent and Trademark Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 04 April 2001 (04.04.01)	
International application No. PCT/CA00/00873	**Applicant's or agent's file reference** 10452-30
International filing date (day/month/year) 26 July 2000 (26.07.00)	**Priority date** (day/month/year) 27 July 1999 (27.07.99)
Applicant CONRAD, Wayne, E. et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

26 February 2001 (26.02.01)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Claudio Borton
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PATENT COOPERATION TREATY

RECD 31 OCT 2001
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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
10452-30		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/CA00/00873	26/07/2000	27/07/1999
International Patent Classification (IPC) or national classification and IPC B04C5/181		
Applicant G.B.D. CORPORATION et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 10 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
26/02/2001	26.10.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Mayer, R Telephone No. +49 89 2399 2094

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/CA00/00873

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-28	as originally filed			

Claims, No.:

1-55	as received on	16/07/2001	with letter of	13/07/2001

Drawings, sheets:

1/15-15/15	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   - ☐ the description, pages:
   - ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1,20,25,39,47
Inventive step (IS)	Yes:	Claims	
	No:	Claims	2-19,21-24,26-38, 40-46,47-55
Industrial applicability (IA)	Yes:	Claims	1-55
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Item V:

1. Independent claims 1, 20,25,39,47 are not consider novel:

1.1 US-A-4486207 discloses a separator with a cyclone chamber, means for introducing and removing, separation means 121 having holes 124 so that particles pass therethrough to particle receiving means 126 (see figures 7,8 and the corresponding text). Consequently, all the features of claim 1 are disclosed.

1.2 All the features of claims 20, 25 and 39 are also known from US-A-4486207 for the same reasons as given in paragraph 1.1.

1.3 All the features of claims 1, 20, 25 and 39 are also known from WO-A-98/43721 (fig. 5), DE-C-875134 (Abb. 1), US-A-2981369 (fig. 3), DE-C-4232382 (fig. 1) and US-A-3988132 (fig. 1).

1.4 WO-A-98/43721 discloses a vacuum cleaner comprising all the features of claim 47 (see figures 1,5 and the corresponding text).

2. Having regard to the dependent claims, the features of these claims, insofar as they are not known from the documents cited in the Search Report for the same purpose as in your application, are generally known to a person skilled in the art, and, therefore, do not add an inventive step to the claims from which they depend.

3. The industrial applicability is obvious.

Item VII:

The description is adapted to the claim, and the prior art known from US-A-4486207, WO-A-98/43721, DE-C-875134, US-A-2981369, DE-C-4232382 nd US-A-3988132 is not cited in the description.

Item VIII:

Independent claims 1, 25 and 39 are not concise as required by Article 6 since each one defines a separator and repeats much of the content of the others. Therefore, it is appropriate to have a single independent claim defining separator.

WE CLAIM:

1. A separator for separating entrained particles from a fluid flow, the separator comprising:

(a) a cyclone chamber an outer wall and a cyclonic flow region, the cyclonic flow region having a radial width, an outer peripheral portion, a medial portion disposed interior of the peripheral portion and an inner portion disposed interior of the medial portion;

(b) a fluid inlet for introducing a cyclonic fluid flow to the cyclonic flow region;

(c) a fluid outlet for removing the fluid flow from the cyclone chamber;

(d) a particle separating member positioned in the cyclone chamber beneath at least a portion of the cyclonic flow region, the particle separating member having a plurality of apertures; and,

(e) a particle receiving chamber disposed beneath the particle separating member for receiving particles passing into the particle receiving chamber through the apertures

wherein the apertures are disposed on the particle separating member such that the medial portion of the cyclonic flow region is substantially free from said apertures.

2. The separator of claim 1 wherein the peripheral portion of the cyclonic flow region comprises one quarter of the radial width of the cyclonic flow portion.

3. The separator of claim 2 wherein the medial portion of the cyclonic flow region comprises one half of the radial width of the cyclonic flow portion.

4. The separator of claim 1 wherein the particle receiving chamber comprises a sealed chamber except for the apertures.

Replaced by Article 34

5. The separator of claim 1 wherein the particle receiving chamber is in communication with a conduit for transporting separated particles downstream from the particle receiving chamber.

6. The separator of claim 1 further comprising:

(a) a cleaner head adapted for movement over a floor and having a fluid nozzle positionable adjacent the floor, the nozzle in fluid flow communication via a passageway with the separator fluid inlet;

(b) a handle for moving the cleaner head over the floor; and,

(c) a casing for housing the cyclone chamber.

7. The separator of claim 6 wherein the casing is pivotally mounted to the cleaner head.

8. The separator of claim 6 wherein the passageway comprises a flexible portion that is positioned external of the cleaner head and the casing and the handle is affixed to the cleaner head.

9. The separator of claim 1 wherein the apertures are sized to inhibit elongate particles from passing there through, whereby elongate particles collect on top of the particle separating member.

10. The separator of claim 1 wherein the apertures are shaped to aerodynamically direct particles from the cyclonic flow region into the particle receiving chamber.

11. The separator of claim 1 wherein the apertures comprise slits having longitudinally extending upstream and downstream edges relative to the fluid flow and transversely extending sides and the edges are longer than the sides.

12. The separator of claim 11 wherein the length of the edges are substantially aligned with the radial width of the cyclone chamber.

13. The separator of claim 11 wherein the length of the edges define a longitudinally extending axis which are at an angle of up to 45° to the radius of the cyclonic flow region.

14. The separator of claim 1 wherein the apertures have an radial outer end and a radial inner end and the radial outer end is positioned adjacent the outer wall of the cyclone chamber.

15. The separator of claim 1 wherein the apertures have an upstream edge and downstream edge, relative to the fluid flow and the thickness of the particle separating member is reduced adjacent the upstream edge of the apertures.

16. The separator of claim 15 wherein the particle separating member has an upper surface and a lower surface and the upper surface is angled towards the particle receiving chamber adjacent the upstream edge and the lower surface is angled away from the aperture adjacent the downstream edge.

17. The separator of claim 1 wherein the particle separating member is disposed substantially perpendicularly to a longitudinal axis of the cyclonic flow region.

18. The separator of claim 1 wherein the particle separating member is disposed at an angle to a longitudinal axis of the cyclonic flow region.

19. The separator of claim 1 wherein the particle separating member is convex or concave.

20. The separator of claim 1 wherein the particle separating member extends under all of the cyclonic flow region to define bottom surface of the cyclonic flow region.

21. The separator of claim 1 wherein the particle separating member extends essentially under only the outer peripheral portion.

22. The separator of claim 1 wherein the apertures are positioned essentially only beneath the peripheral portion of the cyclonic flow region.

23. The separator of claim 1 wherein the apertures are positioned essentially only beneath the inner portion of the cyclonic flow region.

24. The separator of claim 1 wherein the apertures are positioned beneath only the peripheral and inner portions of the cyclonic flow region.

25. The separator of claim 1 wherein the apertures are distributed regularly around the particle separating member.

26. The separator of claim 1 wherein the fluid contacts only a portion of the particle separating member and the apertures are positioned only in said portion.

27. A separator for separating entrained particles from a fluid flow, the separator comprising:

(a) a cyclone chamber for containing a cyclonic flow in a cyclonic flow region, the cyclonic flow region having a radial width, an outer peripheral portion, a medial portion disposed interior of the peripheral portion and an inner portion disposed interior of the medial portion;

(b) means for introducing a fluid flow to the cyclone flow region for cyclonic rotation therein;

(c) means for removing the fluid flow from the cyclone chamber;

(d) particle receiving means disposed beneath the cyclone flow region for receiving particles separated from the fluid flow;

(e) separation means for dividing the particle receiving means from the cyclone chamber; and

(f) transporting means associated with the separation means for connecting the particle receiving means in flow communication with the cyclonic flow region such that, in operation, particles pass through the transporting means to the particle receiving means

wherein said transporting means are positioned outside the medial portion of the cyclonic flow region.

28. The separator of claim 27 wherein the particle receiving means comprises a sealed chamber except for the transporting means and the separator further comprises emptying means for emptying the particle receiving means.

29. The separator of claim 27 further comprising means for connecting the particle receiving means in flow communication with a conduit for transporting separated particles downstream from the particle receiving means.

30. The separator of claim 27 further comprising aerodynamic means associated with the transporting means for directing particles from the cyclonic flow region into the particle receiving means.

31. The separator of claim 27 wherein the particle separating means extends under all of the cyclonic flow region to define bottom surface of the cyclonic flow region.

32. The separator of claim 27 wherein the transporting means are positioned beneath only one or both of the peripheral and inner portions of the cyclonic flow region.

33. The separator of claim 27 wherein the transporting means are distributed regularly around the separating means.

34. The separator of claim 27 wherein the fluid contacts only a portion of the separating means and the transporting means are positioned only in said portion.

35. The separator of claim 27 wherein the transporting means comprise openings in the separation means.

36. A method for separating entrained particles from a fluid flow, the method comprising the steps of:

(a) introducing a fluid to flow cyclonically in a chamber having a cyclonic flow region, the cyclonic flow region having a radial width, an outer peripheral portion, a medial portion disposed interior of the peripheral portion and an inner portion disposed interior of the medial portion;

(b) removing particles from the fluid flow in the cyclone chamber via passages provided beneath one or both of the peripheral and inner portions; and,

(c) removing the fluid flow from the chamber.

37. The method of claim 36 further comprising the steps of storing the particles removed from the fluid flow and inverting the chamber to remove the separated particles.

38. The method of claim 36 further comprising the step of transporting separated particles downstream from the chamber.

39. The method of claim 36 wherein the separator comprises the dirt separation mechanism for a vacuum cleaner and the method further comprises passing a cleaning head over a surface to clean the surface.

40. The method of claim 36 further comprising directing particles to pass into the passages.

41. A separator for separating entrained particles from a fluid flow, the separator comprising:

(a) a cyclone chamber having an outer wall and a cyclonic flow region;

(b) a fluid inlet for introducing a cyclonic fluid flow to the cyclonic flow region;

(c) a fluid outlet for removing the fluid flow from the cyclone chamber;

(d) a particle separation member positioned in the cyclone chamber beneath at least a portion of the cyclonic flow region, the particle separation member having an upper surface and plurality of apertures; and,

(e) a particle receiving chamber disposed beneath the particle separation member for receiving particles passing into the particle receiving chamber through the apertures

wherein the separator is constructed to reduce turbulent fluid flow in the vicinity of the apertures.

42. The separator of claim 41 further comprising a fluid pump for causing the fluid to flow through the separator wherein the fluid flow through the cyclone chamber is pulsed.

43. The separator of claim 41 further comprising a moveable closure member on one of the fluid inlet and the fluid outlet for causing a pulsed fluid flow through the cyclone chamber.

44. The separator of claim 41 wherein the particle separation member has from 5 to 35 apertures.

45. The separator of claim 41 wherein the number of apertures in the particle separation member is calculated by the formula:

$$\text{number of apertures} = \frac{H}{D} \times 4 \pm 20\%$$

where H= the vertical height of the cyclonic flow region

D= the diameter of the cyclone chamber

46. The separator of claim 41 wherein the cyclone chamber has a diameter and each aperture has a longitudinally extending upstream edge and a longitudinally extending downstream edges, relative to the fluid flow, and transverse sides extending between the edges, the edges have a length which is less than 10% of the diameter of the cyclone chamber and the sides have a length which is 25 - 35% of the length of the edges.

47. The separator of claim 46 wherein the edges are substantially radially aligned with the cyclone chamber.

48. The separator of claim 41 wherein each aperture has an upstream edge and a downstream edge, relative to the fluid flow, and the upstream edge is angled towards the particle receiving chamber, the included angle between the upstream edge and the upper surface of the particle separation member is from 15 to 90°.

49. The separator of claim 41 wherein each aperture has an upstream edge and a downstream edge, relative to the fluid flow, and the downstream edge is angled towards the particle receiving chamber, the included angle between the downstream edge and the upper surface of the particle separation member is from 15 to 90°.

50. The separator of claim 41 wherein the fluid flow changes direction and travels to the fluid outlet at a position as it travels over the particle separation member and the separator further comprising a baffle positioned beneath the particle separation member at a position 10 to 20° downstream of the position at which the fluid flow changes direction.

51. The separator of claim 50 wherein the particle receiving chamber has a bottom to comprise a sealed chamber except for the apertures and the baffle extends between the particle separation member and the bottom of the particle receiving chamber.

52. The separator of claim 41 wherein the particle receiving chamber is in communication with a conduit for transporting separated particles downstream from the particle receiving chamber.

53. The separator of claim 41 further comprising:

(a) a cleaner head adapted for movement over a floor and having a fluid nozzle positionable adjacent the floor, the nozzle in fluid flow communication via a passageway with the separator fluid inlet;

(b) a handle for moving the cleaner head over the floor; and,

(c) a casing for housing the cyclone chamber.

54. The separator of claim 41 wherein the particle separation member extends under all of the cyclonic flow region to define bottom surface of the cyclonic flow region.

55. A separator for separating entrained particles from a fluid flow, the separator comprising:

(a) a cyclone chamber for containing a cyclonic flow in a cyclonic flow region;

(b) fluid entry means for introducing a fluid flow to the cyclone flow region for cyclonic rotation therein;

(c) fluid exit means for removing the fluid flow from the cyclone chamber;

(d) fluid pump means for causing fluid flow through the cyclone chamber;

(e) particle receiving means disposed beneath the cyclone flow region for receiving particles separated from the fluid flow;

(f) separation means for dividing the particle receiving means from the cyclone chamber;

(g) transporting means associated with the separation means for connecting the particle receiving means in flow communication with the cyclonic flow region such that, in operation, a boundary layer flow of fluid develops over the separation means and the particles disentrained from the fluid flow pass through the transporting means to the particle receiving means; and,

(h) means for reducing the thickness of the boundary layer of fluid as it travels over the separation means.

56. The separator of claim 55 wherein the means for reducing the thickness of the boundary layer comprises means for pulsing the fluid flow through the cyclone chamber.

57. The separator of claim 56 wherein the means for pulsing the fluid flow through the cyclone chamber comprises means for pulsing an electrical signal to the fluid pump means.

58. The separator of claim 56 wherein the means for pulsing the fluid flow through the cyclone chamber comprises means pulsing for cyclically opening and closing one of the fluid entry means and the fluid exit means.

59. The separator of claim 55 wherein the means for reducing the thickness of the boundary layer comprises constructing and positioning the transporting means to reduce turbulent fluid flow over the separation means.

60. The separator of claim 55 wherein the means for reducing the thickness of the boundary layer comprises constructing and positioning flow

disruption means beneath the separating means for disrupting cyclonic fluid flow in the particle receiving means.

61. The separator of claim 55 wherein the particle receiving means comprises a sealed chamber except for the transporting means and the separator further comprises emptying means for emptying the particle receiving means.

62. The separator of claim 55 wherein the transporting means are aerodynamically shaped to directing particles from the cyclonic flow region into the particle receiving means.

63. A method for separating entrained particles from a fluid flow, the method comprising the steps of:

(a) introducing a fluid to flow cyclonically in a chamber having a cyclonic flow region and a particle separation member positioned in the cyclone chamber to define a particle receiving chamber;

(b) adjusting the back pressure in the chamber to promote the formation of a laminar boundary layer adjacent the particle separation member;

(c) removing particles from the fluid flow in the cyclone chamber via passages provided in the particle separation member; and,

(d) removing the fluid flow from the chamber.

64. The method of claim 63 further comprising the steps of storing the particles removed from the fluid flow and inverting the chamber to remove the separated particles.

65. The method of claim 63 wherein the separator comprises the dirt separation mechanism for a vacuum cleaner and the method further comprises passing a cleaning head over a surface to clean the surface.

66. The method of claim 63 wherein the particle separation member is constructed and positioned to reduce turbulent fluid flow over the particle separation member in the vicinity of the passages and the method further comprises passing the fluid flow over the particle separation member during operation of the chamber.

67. The method of claim 63 wherein the chamber further comprises flow disruption means which is constructed and positioned beneath the separating means for disrupting cyclonic fluid flow in the particle receiving chamber to reduce turbulent fluid flow over the particle separation member in the vicinity of the passages and the method further comprises passing the fluid flow over the particle separation member during operation of the chamber.

68. A vacuum cleaner comprising:

(a) a cyclone chamber having an outer wall and a cyclonic flow region;

(b) a fluid inlet for introducing a cyclonic fluid flow to the cyclonic flow region;

(c) a cleaner head adapted for movement over a surface and having a fluid nozzle positionable adjacent the surface, the nozzle in fluid flow communication via a passageway with the fluid inlet;

(d) a fluid outlet for removing the fluid flow from the cyclone chamber;

(e) a particle separation member positioned in the cyclone chamber beneath at least a portion of the cyclonic flow region, the particle separation member having an upper surface and plurality of apertures; and,

(f) a particle receiving chamber disposed beneath the particle separation member for receiving particles passing into the particle receiving chamber through the apertures;

wherein the separator is constructed to reduce turbulent fluid flow in the vicinity of the apertures.

69. A vacuum cleaner comprising:

(a) a cyclone chamber having an outer wall and a cyclonic flow region;

(b) a air inlet for introducing a cyclonic air flow to the cyclonic flow region;

(c) a cleaner head adapted for movement over a surface and having a air nozzle positionable adjacent the surface, the nozzle in air flow communication via a passageway with the air inlet;

(d) a air outlet for removing the air flow from the cyclone chamber;

(e) a particle separation member positioned in the cyclone chamber beneath at least a portion of the cyclonic flow region, the particle separation member having an upper surface and plurality of apertures;

(f) a particle receiving chamber disposed beneath the particle separation member for receiving particles passing into the particle receiving chamber through the apertures; and,

(g) a motor for causing the air to flow through the vacuum cleaner wherein the air flow through the cyclone chamber is pulsed.

70. The vacuum cleaner of claim 69 further comprising a moveable closure member on one of the air inlet and the air outlet for causing a pulsed air flow through the cyclone chamber.

71. The vacuum cleaner of claim 69 wherein the motor receives an electrical signal and the electrical signal is pulsed to produce the pulsed air flow.

72. A vacuum cleaner comprising:

(a) a cyclone chamber having an outer wall and a cyclonic flow region;

(b) a air inlet for introducing a cyclonic air flow to the cyclonic flow region;

(c) a cleaner head adapted for movement over a surface and having a air nozzle positionable adjacent the surface, the nozzle in air flow communication via a passageway with the air inlet;

(d) a air outlet for removing the air flow from the cyclone chamber;

(e) a particle separation member positioned in the cyclone chamber beneath at least a portion of the cyclonic flow region, the particle separation member having an upper surface and plurality of apertures;

(f) a particle receiving chamber disposed beneath the particle separation member for receiving particles passing into the particle receiving chamber through the apertures; and,

(g) a motor for causing the air to flow through the vacuum cleaner

wherein the particle separation member is constructed and adapted to increase the particle separation efficiency of the cyclone chamber.

73. The vacuum cleaner of claim 72 wherein the particle separation member has from 5 to 35 apertures.

74. The vacuum cleaner of claim 72 wherein the number of apertures in the particle separation member is calculated by the formula:

$$\text{number of apertures} = \frac{H}{D} \times 4 \pm 20\%$$

where H= the vertical height of the cyclonic flow region

D= the diameter of the cyclone chamber

75. The vacuum cleaner of claim 72 wherein the cyclone chamber has a diameter and each aperture has a longitudinally extending upstream edge and a longitudinally extending downstream edges, relative to the air flow, and transverse sides extending between the edges, the edges have a length which is less than 10% of the diameter of the cyclone chamber and the sides have a length which is 25 - 35% of the length of the edges.

76. The vacuum cleaner of claim 75 wherein the edges are substantially radially aligned with the cyclone chamber.

77. The vacuum cleaner of claim 72 wherein each aperture has an upstream edge and a downstream edge, relative to the air flow, and the

upstream edge is angled towards the particle receiving chamber, the included angle between the upstream edge and the upper surface of the particle separation member is from 15 to 90°.

78. The vacuum cleaner of claim 72 wherein each aperture has an upstream edge and a downstream edge, relative to the air flow, and the downstream edge is angled towards the particle receiving chamber, the included angle between the downstream edge and the upper surface of the particle separation member is from 15 to 90°.

79. The vacuum cleaner of claim 72 wherein the air flow changes direction and travels to the air outlet at a position as it travels over the particle separation member and the vacuum cleaner further comprising a baffle positioned beneath the particle separation member at a position 10 to 20° downstream of the position at which the air flow changes direction.

80. The vacuum cleaner of claim 79 wherein the particle receiving chamber has a bottom to comprise a sealed chamber except for the apertures and the baffle extends between the particle separation member and the bottom of the particle receiving chamber.

INTERNATIONAL SEARCH REPORT

Internal Application No
PCT/CA 00/00873

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B04C5/181 B04C11/00 A47L9/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B04C A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 486 207 A (BAILLIE) 4 December 1984 (1984-12-04) column 12, line 45 - line 52 column 20, line 61 -column 22, line 11 column 22, line 60 -column 23, line 3; figures 2,7,8	1-5,14, 17,19, 20,22, 25-29, 31-36, 38,40, 41,44, 52,54, 55,61, 63,66
Y		6,8,42, 53,65, 68,72,73
A		11,12, 24,37,

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 October 2000	03/11/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Van der Zee, W

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
		42,46, 47,51, 59,64, 69, 74-76,80

X	WO 98 43721 A (KONINKLIJKE PHILIPS ELECTRONICS NV ET AL) 8 October 1998 (1998-10-08) page 8, line 10 - line 20 page 9, line 24 - line 29; figures 1,5	27,28, 31,32, 34,36, 37,39,40
Y		6,8,53, 65,68, 72,73
A		1-4,14, 17,20, 22,24, 26,35, 41,42, 51,54, 55,61, 63,64, 69,80

Y	GB 2 282 979 A (HUYTON) 26 April 1995 (1995-04-26) page 9, line 18 -page 10, line 20; figure 2	42
A		56,69

A	US 1 937 765 A (LEATHERS) 5 December 1933 (1933-12-05) page 1, column 30 -column 63; figure 1	7

X	DE 875 134 C (METALLGESELLSCHAFT AG) 30 April 1953 (1953-04-30) page 2, line 66 - line 98; figures	1-5,10, 14, 17-22, 25-36, 38,40
A		11,12, 24,41, 42,44, 47,51, 52,54, 55,59, 61-64, 66,68, 69,72, 73,76,80

	-/--	

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
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